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F61 - Nuclear Magnetic Resonance

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1 Introduction

In Protokoll we will examine the usage nuclear magnetic resonance to identify probes and reveal the structure of objects.

2 Basics

Any nuclei with an existent spin S has a magnetic dipole moment:

$$\vec{\mu} = \hbar\gamma\vec{S}$$

where γ is the gyromagnetic ration.

This magnetic dipole $\vec{\mu}$ interacts with an external magnetic field $\vec{B}_0$ and is associated with an interaction energy ΔE:

$$\Delta E = -\vec{\mu} \cdot \vec{B}_0$$

This interaction yields both a parallel μ_+ and antiparallel μ_- orientation of the protons magnetic dipole in the external field. For a macroscopic sample of N protons, the number of occupied states N_+ and N_-, the sum of which comprises N, can be approximated by a Boltzmann distribution:

$$N_\pm = N_0 e^{-\frac{E_0 \pm \Delta E}{kt}}$$

with a normalization factor N_0.

3 Measurements

4 Analysis

5 Critical Discussion